CLAIMS

1. An animation rendering system, comprising:

a high-level animation subsystem that handles interaction functions for the system;

a low-level animation subsystem that handles display functions for the system;

at least one high-level clock that is referenced by high-level animation operations;

at least one low-level clock that is referenced by low-level animation operations;

a communications channel for sending messages between the high-level animation subsystem and the low-level animation subsystem according to a communications protocol; and

wherein the communications protocol includes information provided to the low-level animation subsystem by the high-level animation subsystem that designates an animation and specifies how the animation is to change over a specified period of time, thereby ensuring that the low-level animation system has information to process several frames of the animation.

2. The animation rendering system as recited in claim 1, wherein the communications between the high-level animation subsystem and the low-level animation subsystem are asynchronous.

3. The animation rendering system as recited in claim 1, wherein:

the low-level animation subsystem renders animations at a constant display frame refresh rate; and

the high-level animation subsystem handles interactions at a variable rate that is slower than the constant display frame refresh rate.

4. The animation rendering system as recited in claim 1, wherein the communication protocol further comprises at least one message sent from the low-level animation subsystem to the high-level animation subsystem to handle synchronization between the high-level animation subsystem and the low-level animation subsystem.

5. The animation rendering system as recited in claim 4, wherein one message sent from the low-level animation subsystem to the high-level animation subsystem further comprises a "synchronize with media slip" message that identifies a target clock associated with an animation and an amount that the target clock must slip to synchronize the high-level animation subsystem with the animation being run by the low-level animation subsystem.

6. The animation rendering system as recited in claim 1, wherein:

the high-level animation subsystem further comprises a high-level timing engine;

the low-level animation subsystem further comprises a low-level timing engine; and

the communication protocol further comprises the following parameterized messages that are sent from the high-level timing engine to the low-level timing engine:

a create clock message with initial clock properties parameter;

an update properties message with a target clock parameter and an updated properties parameter;

an add interval message with a target clock parameter and an interval properties parameter;

a reset synchronization slip message with a target clock parameter;

a remove all intervals message with a target clock parameter; and

a delete clock message with a target clock to delete parameter.

7. The animation rendering system as recited in claim 1, wherein:

the high-level animation subsystem further comprises a high-level animation objects database;

the low-level animation subsystem further comprises a low-level animation objects database; and

the communication protocol further comprises the following parameterized messages that are sent from the high-level animation objects database to the low-level animation objects database:

a create animation message with an output value type parameter, an animation function parameter and a controlling clock parameter;

an update animation message with a target animation parameter and an updated properties parameter;

a create animation collection message with a list of animations parameter;

an add animation to collection message with a target animation collection parameter and an animation to add parameter;

a remove animation to collection message with a target animation collection parameter and an animation to remove parameter;

a create static value message with a value type parameter and an initial value parameter; and

an update static value parameter with a target static value object parameter and a new value parameter.

8. A method for processing an animation application, comprising:

receiving animation data from the animation application into a high-level animation subsystem;

transmitting animation information from the high-level animation subsystem to a low-level animation subsystem according to a communication protocol over a communications channel so that the low-level animation subsystem can display an animation associated with the animation data;

wherein the communication protocol provides for designating an animation and for instructions regarding how the animation should change over a particular time period so that the low-level animation subsystem can process several frames of the animation at a constant display frame refresh rate while the high-level animation subsystem executes at a variable refresh rate.

9. The method as recited in claim 8, further comprising the high-level animation subsystem receiving at least one protocol message from the low-level animation subsystem to assist in keeping a timing element in the high-level animation subsystem synchronized with at least a timing element in the low-level animation subsystem.

10. The method as recited in claim 8, wherein the communication protocol includes the following messages that are sent from a high-level animation subsystem timing element to a low-level animation subsystem timing element:

a message to create a clock;

a message to update clock properties;

a message to add an interval to a clock;

a message to remove all intervals for a clock; and

a message to delete a clock.

11. The method as recited in claim 10, wherein the communication protocol further includes the following messages that are sent from a high-level animation subsystem timing element to a low-level animation subsystem timing element:

a message to reset a synchronization slip value in the low-level animation subsystem.

12. The method as recited in claim 8, wherein the communication protocol includes the following messages that are sent from a high-level animation subsystem animation object element to a low-level animation subsystem animation object element:

a message to create an animation;

a message to update an animation;

a message to create an animation collection;

a message to add an animation to an animation collection; and

a message to remove an animation from an animation collection.

13. The method as recited in claim 8, wherein the communication protocol includes the following messages that are sent from a high-level animation subsystem animation object element to a low-level animation subsystem animation object element:

a message to create a static display value; and

a message to update a static display value.

14. A system, comprising:

a high-level animation subsystem configured to receive animation information from an application;

a low-level animation subsystem configured to render one or more animations according to the animation information;

a low-level timing engine configured to monitor one or more low-level clocks in the low-level animation subsystem and to synchronize the low-level clocks with one or more high-level clocks;

a high-level timing engine configured to monitor one or more high-level clocks in the high-level animation subsystem according to one or more high-level animation objects and to transmit animation messages to the low-level timing engine, the animation messages conforming to a communication protocol; and

wherein the animation messages that are transmitted from the high-level timing engine to the low-level timing engine designate one or more animation objects and how the animation objects are to change over a specified period of time.

15. The system as recited in claim 14, wherein the low-level timing engine synchronizes a low-level clock with a high-level clock by sending a "synchronize with media slip" message that identifies the high-level clock and an amount by which the high-level clock must slip to maintain synchronization with a low-level clock that corresponds to the high-level clock.

16. The system as recited in claim 14, wherein the communication protocol further comprises the following messages:

a create clock message that identifies clock properties;

an update properties message that identifies updated clock properties;

an add interval message that adds a timing interval to clock properties;

a remove intervals message that removes timing intervals from clock properties; and

a delete clock message that deletes a clock.

17. The system as recited in claim 14, wherein the communication protocol further comprises the following messages:

a create animation message that creates an animation;

an update animation message that updates an existing animation;

a create animation collection that identifies multiple animations to be grouped;

an add animation to collection message that identifies an animation to add to an identified animation collection; and

a remove animation to collection message that identifies an animation to remove from an identified animation collection.

18. The system as recited in claim 14, wherein the communication protocol further comprises the following messages:

a create static value message that identifies a value type and an initial value to display; and

an update static value message that identifies a static value to update and a new value for the static value.

19. The system as recited in claim 14, wherein the low-level timing engine is configured to send a synchronization message to the high-level timing engine according to the communication protocol that identifies a high-level clock and measure of how much the high-level clock should be altered to synchronize the high-level clock with a low-level clock.

20. The system as recited in claim 14, further comprising:

at least one low-level animation object;

at least one high-level animation object configured to communicate with the low-level animation objects through communication protocol messages to create and update the low-level animation objects to reflect the high-level animation objects.

21. A high-level animation subsystem in an animation rendering system, comprising:

one or more high-level clocks;

a high-level timing engine configured to track the one or more high-level clocks;

one or more animation objects that identify at least a portion of an animation;

means for transmitting animation data to a low-level animation subsystem according to messages included in a communication protocol; and

wherein the communication protocol messages transmitted to the low-level animation subsystem identifies at least one of the animation objects in the low-level animation subsystem and provides data regarding how the identified animation objects are to change over a specified period of time.

22. The high-level animation subsystem recited in claim 21, wherein the communication protocol further comprises the following messages:

a create clock message that identifies initial clock properties;

an update properties message that identifies updated clock properties;

an add interval message that identifies an interval to be added to a clock;

a remove all intervals message that identifies a clock from which all intervals are to be removed; and

a delete clock message that identifies a clock to be deleted.

23. The high-level animation subsystem recited in claim 21, wherein the communication protocol further comprises the following messages:

a create animation message that describes an animation to create; and

an update animation message that identifies an animation to update and updated properties.

24. The high-level animation subsystem recited in claim 21, wherein the communication protocol further comprises the following messages:

a create animation collection message that identifies multiple animations that are to be grouped as one animation collection;

an add animation to collection message that identifies an animation to be added to an identified animation collection; and

a remove animation from collection message that identifies an animation to be removed from an identified animation collection.

25. The high-level animation subsystem recited in claim 21, wherein the communication protocol further comprises the following messages:

a create static value message that identifies a value type and an initial value to render; and

an update static value message that identifies a static value to update and a new value for the static value.

26. A low-level animation subsystem in an animation rendering system, comprising:

one or more low-level clocks;

one or more low-level animation objects that identify at least a portion of an animation;

a low-level timing engine configured to track the one or more low-level clocks with regard to the one or more low-level animation objects;

wherein the low-level clocks and the low-level animation objects are created and updated through communication protocol messages received at a variable rate from a high-level animation subsystem in a manner that provides the low-level animation subsystem with several frames of animation data that can be displayed at a high, constant display frame refresh rate.